



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|-------------|----------------------|---------------------|------------------|
| 10/694,395 | 10/28/2003 | Young-ju Kim | 249/685 | 9200 |
| 27849 | 7590 | 03/07/2006 | EXAMINER | |
| LEE & MORSE, P.C. 1101 WILSON BOULEVARD SUITE 2000 ARLINGTON, VA 22209 | | | VAN ROY, TOD THOMAS | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 2828 | |

DATE MAILED: 03/07/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/694,395

Applicant(s)

KIM ET AL.

Examiner

Tod T. Van Roy

Art Unit

2828

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 January 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10/28/2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Drawings

The examiner has accepted the drawings filed 10/28/2003.

Response to Amendment

The examiner acknowledges the amending of claims 10 and 12, and the addition of claims 13-15.

Response to Arguments

Applicant's arguments filed 01/09/2006 have been fully considered but they are not persuasive.

With respect to claims 1, 6, and 12, the applicant has stated that the combination of the applicant admitted prior art (APA) and the Ikeuchi reference fails to teach the thermistor setting an upper limit of the laser driving circuit. The applicant further states the thermistor of Ikeuchi changes the value of the current, not the limit of the current (Remarks, pg.7 para.2). The examiner feels that it is true that the thermistor of Ikeuchi changes the value of the current, but that the limit of the current is also set with the use of the thermistor. The resistance value of the thermistor changes with a corresponding change in temperature of the system to an upper and lower value based on the device characteristics (max/min resistance for max/min temperature). Therefore, the upper and lower resistance values of the thermistor inherently set the max/min driving current limit.

The applicant also makes reference to the inclusion of the entire compensation circuit of Ikeuchi with the APA (Remarks, pg.2 para.1). This combination was not suggested or motivated by the examiner. Namely, claim 1 recites a "conceptual" circuit

Art Unit: 2828

and its function, and the Ikeuchi reference is used to motivate the inclusion of temperature dependence into the APA design. In the subsequent claims the APA teaches the necessary circuit components when needed, but fails to teach the use of the thermistor. The Ikeuchi reference is again relied upon at this point to motivate the use of this circuit element.

Please see below for an updated rejection of claims 12-15.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's admitted prior art in view of Ikeuchi et al. (US 6795656).

With respect to claim 1, the applicant's admitted prior art teaches a laser diode driving circuit comprising: a laser diode driving unit which outputs a laser diode driving current ([0006]), and a laser diode protection unit which sets a limit of the laser diode driving current output from the laser diode driving unit ([0006]). The applicant's admitted prior does not teach the protection circuit to increase the limit of the laser diode driving current as an ambient temperature of a laser diode increases. Ikeuchi teaches a driving and protection circuit wherein it is taught to increase the output current based on the ambient temperature of the laser diode (col.11 lines 4-15). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the applicant's admitted prior art with the temperature controlled output current to realize stable operation in a broader range of the change in temperature (Ikeuchi, col.11 lines 15-17).

With respect to claim 2, the applicant's admitted prior art teaches a resistor coupled to an emitter and base of a first transistor that limits the maximum driving current output by the laser diode driving unit (fig.1 R2, [0012]). The admitted prior art does not teach the use of a thermistor. Ikeuchi teaches a thermistor coupled to transistors that limit the output of the laser diode-driving unit (fig.10 TH2). It would have been obvious to one of ordinary skill in the art at the time of the invention to replace the resistor of the prior art with a thermistor, as it is well known that a thermistor performs the same function as a resistor (i.e. resistance) as well as to make the limiting circuit a function of temperature to compensate for the reduction of optical power in the laser due to an increase in temperature (Ikeuchi, col.11 lines 40-50).

With respect to claim 3, the prior art additionally teaches a second transistor that outputs a driving current to the laser diode when the second transistor is turned on (fig.1 Q1, [0011]).

With respect to claim 4, the prior art additionally teaches a collector of the first transistor (fig.1 Q2) is coupled to a base of the second transistor (fig.1 Q1) and operates to turn off the second transistor when the first transistor is on ([0010]).

With respect to claim 5, the prior art teaches the use of a resistor, and does not teach the use of a negative temperature coefficient thermistor. Ikeuchi teaches the use of a negative temperature coefficient thermistor (col.11 lines 9-10). It would have been obvious to one of ordinary skill in the art at the time of the invention to replace the resistor of the prior art with a negative temperature coefficient thermistor to allow for the increase in drive current due to the decrease in resistance when the ambient temperature rises (Ikeuchi, col.11 lines 9-15).

With respect to claim 6, the prior art teaches laser diode driving circuit comprising: a first transistor which outputs a laser diode driving current (fig.1 Q1), a second transistor (fig.1 Q2) which is turned on and turns off the first transistor when a current flowing through a node of the first transistor reaches a predetermined value ([0010]), the node being other than a node through which the first transistor outputs the laser diode driving current and a node through which the first transistor receives a reference signal, and a resistor (fig.1 R2) which sets the current that turns on the second transistor. The prior art does not teach the use of a thermistor. Ikeuchi teaches a negative temperature coefficient thermistor coupled to transistors that limit the output

Art Unit: 2828

of the laser diode-driving unit (fig.10 TH2). It would have been obvious to one of ordinary skill in the art at the time of the invention to replace the resistor of the prior art with a thermistor, as it is well known that a thermistor performs the same function as a resistor (i.e. resistance) as well as to make the limiting circuit a function of temperature to compensate for the reduction of optical power in the laser due to an increase in temperature (Ikeuchi, col.11 lines 40-50).

With respect to claim 7, the prior art teaches the use of a resistor which limits the output of the drive circuit, but does not teach the use of a negative temperature coefficient thermistor. Ikeuchi teaches a negative temperature coefficient thermistor coupled to transistors that limit the output of the laser diode-driving unit (fig.10 TH2), and control the output power compensating for changes in temperature (col.11 lines 40-50). It would have been obvious to one of ordinary skill in the art at the time of the invention to replace the resistor of the prior art with a thermistor, as it is well known that a thermistor performs the same function as a resistor (i.e. resistance) as well as to make the limiting circuit a function of temperature to compensate for the reduction of optical power in the laser due to an increase in temperature (Ikeuchi, col.11 lines 40-50) maintaining a power level independent of temperature.

With respect to claim 8, the prior art teaches a current limited laser diode driving circuit comprising: a laser diode (fig.1 LD), means for controlling an application of a driving current to the laser diode (fig.1 #102); and means for limiting the driving current output from the controlling means so as to increase a limit of the driving current (fig.1 R2, changing this resistance value performs the function of the changing the driving

Art Unit: 2828

current value). The prior art does not increasing the drive current as an ambient temperature of the laser diode increases. Ikeuchi teaches a driving and protection circuit wherein it is taught to increase the output current based on the ambient temperature of the laser diode (col.11 lines 4-15). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the applicant's admitted prior art with the temperature controlled output current to realize stable operation in a broader range of the change in temperature (Ikeuchi, col.11 lines 15-17).

With respect to claim 9, the prior art teaches the driving circuit as outlined in claim 8, including the resistor whose value limits the output current, but does not teach the use of a thermistor to set the operating current of a second transistor. Ikeuchi teaches a thermistor coupled to transistors that limit the output of the laser diode-driving unit (fig.10 TH2). It would have been obvious to one of ordinary skill in the art at the time of the invention to replace the resistor of the prior art with a thermistor, as it is well known that a thermistor performs the same function as a resistor (i.e. resistance) as well as to make the limiting circuit a function of temperature to compensate for the reduction of optical power in the laser due to an increase in temperature (Ikeuchi, col.11 lines 40-50).

With respect to claim 10, the prior art additionally teaches a first transistor responsive (fig.1 Q1) to a second transistor (fig.1 Q2) that outputs a driving current to the laser diode when the first transistor is on ([0011]).

With respect to claim 11, the prior art teaches the use of a resistor, and does not teach the use of a negative temperature coefficient thermistor. Ikeuchi teaches the use

Art Unit: 2828

of a negative temperature coefficient thermistor (col.11 lines 9-10). It would have been obvious to one of ordinary skill in the art at the time of the invention to replace the resistor of the prior art with a negative temperature coefficient thermistor to allow for the increase in drive current due to the decrease in resistance when the ambient temperature rises (Ikeuchi, col.11 lines 9-15).

With respect to claim 12, the admitted prior art teaches a method for limiting the driving current applied to a laser diode comprising: passing a current through a resistor (fig.1 R2) to provide an adjustable current (based on chosen value of the resistor), providing the current to the laser diode when the adjustable current is below a predetermined threshold (based on resistor value), and preventing the current from reaching the laser diode when the adjustable current is above the predetermined threshold ([0006-12], chosen value of R2 controls the transistor Q2 which in turn controls Q1 and the applied current to the laser diode). The prior art does not teach the use of a thermistor in place of the resistor. Ikeuchi teaches a negative temperature coefficient thermistor coupled to transistors that limit the output of the laser diode-driving unit (fig.10 TH2). It would have been obvious to one of ordinary skill in the art at the time of the invention to replace the resistor of the prior art with a thermistor, as it is well known that a thermistor performs the same function as a resistor (i.e. resistance) as well as to make the limiting circuit a function of temperature to compensate for the reduction of optical power in the laser due to an increase in temperature (Ikeuchi, col.11 lines 40-50).

With respect to claim 13, the admitted prior art and Ikeuchi teach the method of claim 12, and further teach the predetermined threshold increases as an ambient temperature of the laser diode increases (due to the negative temperature coefficient).

With respect to claim 14, the admitted prior art and Ikeuchi teach the method of claim 12, and further teach that providing the current includes turning on a first switch (fig.1 Q1).

With respect to claim 15, the admitted prior art and Ikeuchi teach the method of claim 14, and further teach preventing the current includes turning on a second switch to turn off the first switch (fig.1 Q2 turns on, Q1 turns off, [009-10]).

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

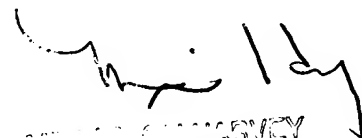
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tod T. Van Roy whose telephone number is (571)272-8447. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Minsun Harvey can be reached on (571)272-1835. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

TVR



MIN SUN HARVEY
SUPERVISOR